

wherin:

$b\tau t$  is the bolt shear proof stress, such that  $b\tau t = TSt / \sqrt{3}$ ,

$TSt$  is the tensile strength of the bolts at a predetermined high temperature,

$\mu$  is a coefficient of slip at the room temperature,

$N_0$  is a design bolt tension,

$v$  is safety factor for a long-term load, and

$bAs$  is a cross-sectional area of a bolt shank.

11. (New) The bolted connection structure according to claim 10,

wherein at least one particular beam of the beams has a long-term allowable shear force at the room temperature which satisfies the following:

$Qs \leq \{ns \times b\tau + (nf - ns) \times b\tau t\} \times bAs$ , and

wherin:

$Qs$  is a long-term allowable shear force of the particular beam at the room temperature, such that  $Qs = fs \times Ab$ ,

$fs$  is a particular long-term allowable shear proof stress of the beam,

$Ab$  is a cross-sectional area of the particular beam,

$ns$  is a number of tension bolts in a floor slab on an upper flange side of the particular beam,

$b\tau$  is a shear proof stress of bolt at the room temperature, such that  $b\tau = TS / \sqrt{3}$ ,

$TS$  is a tensile strength of the bolts at the room temperature, and

$nf$  is a number of tension bolts on the upper flange side of the particular beam.

12. (New) The bolted connection structure according to claim 10, further comprising:  
sets of a high-strength bolt, a nut, a washer and joint metals, wherein the nut is a general  
structural hexagon nut, and the washer is a structural high-strength plain washer, and wherein no  
fire resistance is provided for the nut and the washer.

13. (New) The bolted connection structure according to claim 10, further comprising:  
sets of a high-strength bolt, a nut, a washer and joint metals, wherein at least a portion of  
the joint metals are composed of a steel material having a predetermined high-temperature  
strength.

14. (New) The bolted connection structure according to claim 10, wherein at least a portion of at  
least one of the columns and the beams used is composed of a steel material having a  
predetermined high-temperature strength.

15. (New) The bolted connection structure according to claim 10,  
wherein at least one particular bolt of the high-strength bolts is an ultra-high-strength bolt  
which contains approximately, in % by weight, C: 0.30 ~ 0.45%, Si: less than 0.10%, Mn: more  
than 0.40% ~ less than 1.00%, P: less than 0.010%, S: 0.010% or less, Cr: 0.5% or more ~ less  
than 1.5%, Mo: more than 0.35% ~ less than 1.5%, V: more than 0.3% ~ 1.0% or less, with the  
balance being Fe and unavoidable impurities, and which has the fire resistance and a particular  
resistance to a delayed fracture such that following relations are satisfied:

$$TS \leq (1.1 \times T + 850), \text{ and}$$

$$TS \leq (550 \times C_{eq} + 1000),$$

wherein:

TS is a tensile strength of the particular bolt at the room temperature,

T is a tempering temperature, and

Ceq is carbon equivalent, such that

$$\text{Ceq} = \text{C} + (\text{Mn}/6) + (\text{Si}/24) + (\text{Ni}/40) + (\text{Cr}/5) + (\text{Mo}/4) + (\text{V}/14).$$

16. (New) The bolted connection structure according to claim 12, wherein the high-strength bolt is an ultra-high-strength bolt which contains approximately, in % by weight, C: 0.30 ~ 0.45%, Si: less than 0.10%, Mn: more than 0.40% ~ less than 1.00%, P: less than 0.010%, S: 0.010% or less, Cr: 0.5% or more ~ less than 1.5%, Mo: more than 0.35% ~ less than 1.5%, V: more than 0.3% ~ 1.0% or less, with the balance being Fe and unavoidable impurities, and which has the fire resistance and a particular resistance to a delayed fracture such that following relations are satisfied:

$$\text{TS} \leq (1.1 \times T + 850), \text{ and}$$

$$\text{TS} \leq (550 \times \text{Ceq} + 1000),$$

wherein:

TS is a tensile strength of the high-strength bolt at the room temperature,

T is a tempering temperature, and

Ceq is carbon equivalent, such that

$$\text{Ceq} = \text{C} + (\text{Mn}/6) + (\text{Si}/24) + (\text{Ni}/40) + (\text{Cr}/5) + (\text{Mo}/4) + (\text{V}/14).$$

17. (New) The bolted connection structure according to claim 13, wherein the high-strength bolt is an ultra-high-strength bolt which contains approximately, in % by weight, C: 0.30 ~ 0.45%, Si: less than 0.10%, Mn: more than 0.40% ~ less than 1.00%, P: less than 0.010%, S: 0.010% or less, Cr: 0.5% or more ~ less than 1.5%, Mo: more than 0.35% ~ less than 1.5%, V: more than 0.3% ~ 1.0% or less, with the balance being Fe and unavoidable impurities, and which has excellent fire resistance and resistance to delayed fracture such that following relations are satisfied:

TS ≤ (1.1 × T + 850), and

TS ≤ (550 × Ceq + 1000),

wherein:

TS is a tensile strength of the high-strength bolt at room temperature,

T is a tempering temperature, and

Ceq is carbon equivalent, such that

$$\text{Ceq} = \text{C} + (\text{Mn}/6) + (\text{Si}/24) + (\text{Ni}/40) + (\text{Cr}/5) + (\text{Mo}/4) + (\text{V}/14).$$

18. (New) The bolted connection structure according to claim 14,

wherein at least one of the bolts is an ultra-high-strength bolt which contains approximately, in % by weight, C: 0.30 ~ 0.45%, Si: less than 0.10%, Mn: more than 0.40% ~ less than 1.00%, P: less than 0.010%, S: 0.010% or less, Cr: 0.5% or more ~ less than 1.5%, Mo: more than 0.35% ~ less than 1.5%, V: more than 0.3% ~ 1.0% or less, with the balance being Fe and unavoidable impurities, and which has excellent fire resistance and resistance to delayed fracture such that following relations are satisfied:

TS ≤ (1.1 × T + 850), and

TS ≤ (550 × Ceq + 1000),

wherein:

TS is a tensile strength of the high-strength bolt at the room temperature,

T is a tempering temperature, and

Ceq is carbon equivalent, such that

$$\text{Ceq} = \text{C} + (\text{Mn}/6) + (\text{Si}/24) + (\text{Ni}/40) + (\text{Cr}/5) + (\text{Mo}/4) + (\text{V}/14).$$